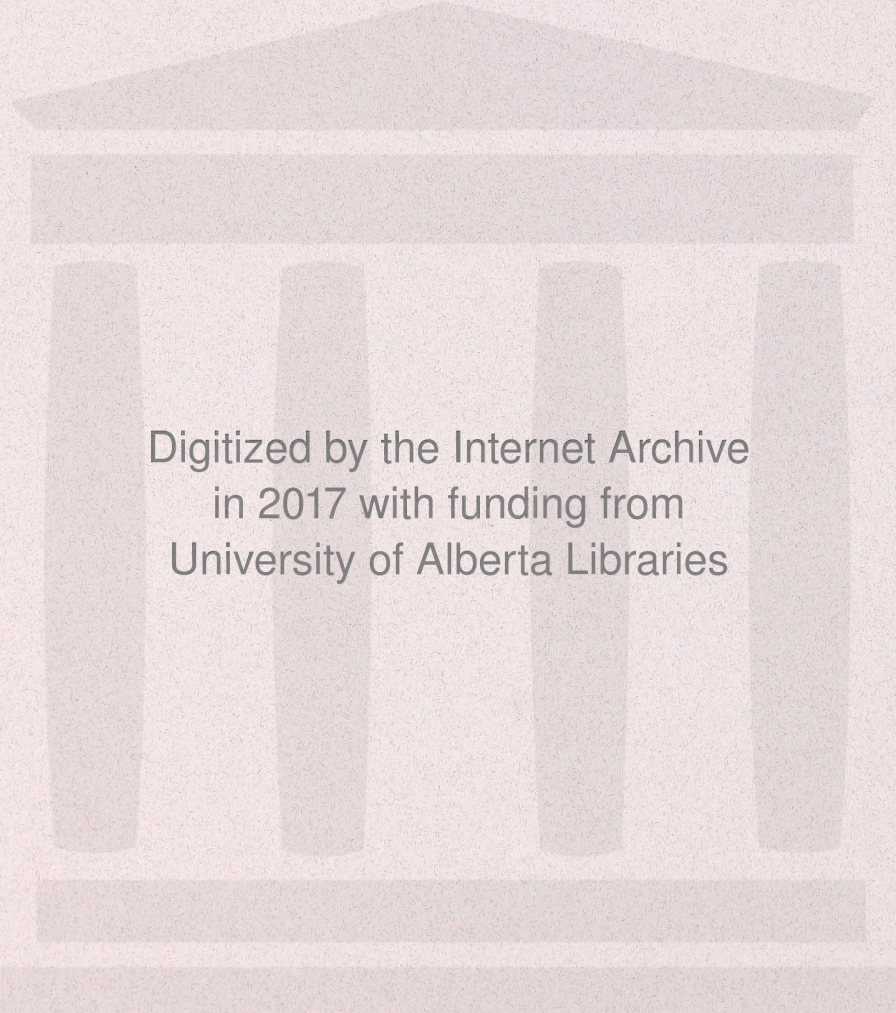


Occupational Injuries and Diseases in Alberta

Exploration
1997 to 2001

Upstream Oil and Gas
Sub-Sector #1





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1. Introduction

Alberta Human Resources and Employment (AHRE) invests in people and workplaces. AHRE develops and delivers programs and services, which contribute to workplaces that are safe, healthy, fair and stable for employees and employers. Workplace Health and Safety is part of the continuum of services provided by Alberta Human Resources and Employment. The Department promotes the development of effective work site health and safety management systems and compliance programs and supports fair and effective resolution of workplace issues. AHRE works in partnership with Alberta Workers' Compensation Board (WCB), safety associations, employers, workers and labour to promote prevention of workplace injuries and diseases.

To this end, AHRE recognizes that monitoring workplace health and safety will help to ensure that primary concerns are actively managed and that resources are directed where needed. To parallel the increase in workforce covered by Alberta legislation, the number of Occupational Health and Safety officers dedicated to enforcement was increased. The officers are responsible for: ensuring that workers and employers are knowledgeable about Occupational Health and Safety Act; investigating serious incidents, fatalities and complaints; performing workplace inspections; and ensuring compliance with regulations if employers are found to be in violation.

Role of Alberta Human Resources and Employment

AHRE helps employers and workers ensure safe, healthy and productive workplaces in Alberta by:

- ◆ Providing workplace health and safety information and assistance to all Albertans.
- ◆ Investigating serious incidents and complaints about potential work site hazards.
- ◆ Partnering with industry leaders and safety associations to develop health and safety programs.
- ◆ Enforcing the *Occupational Health and Safety Act*.

This report summarises the lost-time injuries and disease descriptions, characteristics of the injured worker and the risk of injury to workers in Alberta's upstream oil and gas industries for the years 1997 to 2001. Cost of the injuries and revenue in terms of total premiums paid by employers are presented as well. Finally, a summary of occupational fatalities accepted by the WCB for compensation and brief descriptions of fatalities investigated by AHRE are also provided.

The purpose of this report is to provide government, employers, workers and health and safety officers in upstream oil and gas industries with information about the industry key health and safety issues.

Business Rules

Lost-Time Claim Rate

The lost-time claim rate can only be considered reliable for employers with 40 or more person years; it is recommended that the lost-time claim rate not be calculated based upon fewer than 40 person years.

Duration Rate

Duration rate is highly unstable when based on a few lost-time claims; it is recommended that the duration rate not be calculated based upon fewer than 30 lost-time claims.

Percent

Percents may not add up to a 100 because of rounding.

Description of Upstream Oil and Gas Industries

The upstream oil and gas industries can be subdivided into the following sub-sectors.

Exploration, Oilfield Maintenance and Construction, Well Servicing with Service Rigs including Power Swivels, Drilling of Oil and Gas Wells, Downhole and Other Oilfield Services, Tar Sands, Oil and Gas Exploration and Development, and Oilfield Trucking Services.

The next section gives the descriptions of the Exploration sub-sector.

2. Sub-Sector Description

Upstream Oil and Gas Sub-Sector #1: Exploration

i. Seismic Geophysical/Mineral Exploration (Industry Code 09200)

This industry involves conducting exploration using seismic technology for the purpose of locating formations beneath the earth's surface that may produce usable minerals such as coal, or oil and gas.

The basic procedure used to locate favorable formation beneath the earth's surface is to send shock waves into the ground, and record the patterns on seismic recording equipment.

When exploring for oil and gas, any one of the following three methods may be employed to create the shock waves:

1. Seismographic – Dynamite exploded in a shot hole;
2. Vibroseismic – tractor or truck mounted vibrators which are released to the ground at certain points; and
3. Vacuum Guns – truck mounted piston strikes base plate to send shock waves through the ground.

When exploring for minerals, such as coal, shock waves are created by means of small hand tools. Larger equipment is not required as minerals formations are generally not located as deep below the surface as are oil and gas.

Sound waves are received through instrument referred to as geophones. The geophones are in turn wired to recording instruments that log the sound wave patterns. The data processing and analysis of the obtained information, may or may not, be part of the contract.

This industry does not cover shot hole drilling. This is normally subcontracted out to another company classified in industry code 09201. Should an employer conduct drilling in conjunction with exploration, an additional industry is required.

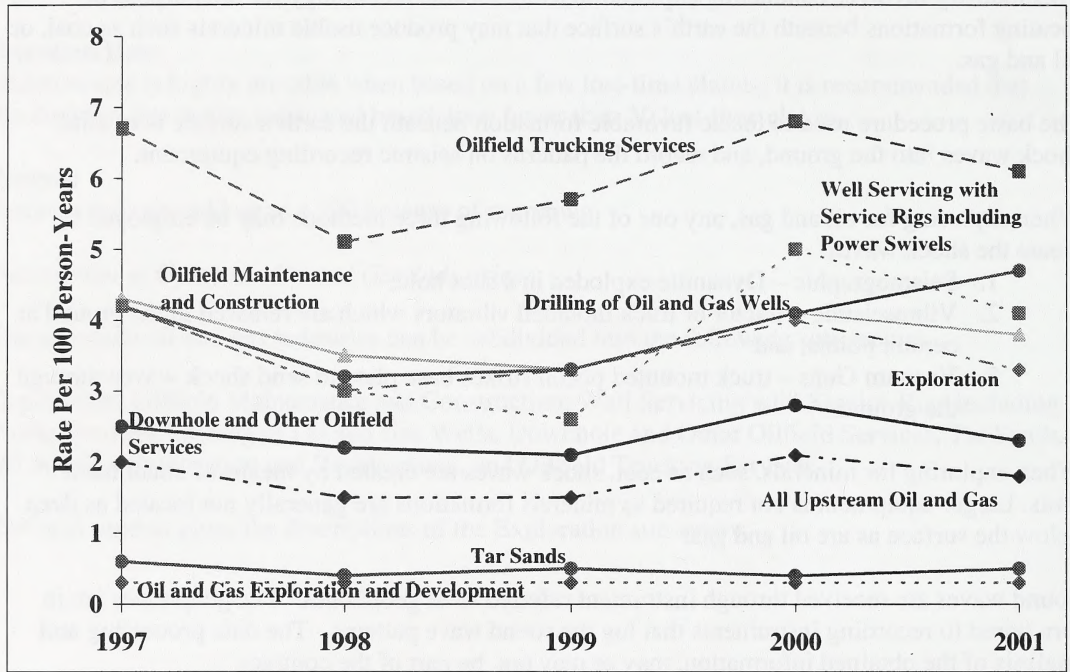
Geophysical Exploration, other than seismic, is classified in industry code 86405. The key difference is the generation and recording shock waves.

ii. Shot Hole Drilling (Industry Code 09201)

The purpose of this industry is to drill bore holes for the purpose of holding explosives used in seismic exploration activities.

Shot hole drilling is performed with a small truck-mounted driller. This is normally a shallow drilling operation, drilling to a depth of 50 to 75 feet. This activity involves drilling only, as an exploration crew is responsible for placing and discharging the explosives. When the explosives are discharged or shot, the vibrations are recorded on a seismograph.

Lost-Time Claim Rate **Upstream Oil and Gas Sub-Sectors** **Alberta: 1997-2001**



Lost-Time Claim Rate	1997	1998	1999	2000	2001
All Upstream Oil and Gas	2.0	1.5	1.5	2.1	1.8
Exploration	4.2	3.0	3.3	4.0	3.3
Oilfield Maintenance and Construction	4.3	3.5	3.3	4.1	3.8
Well Services with Service Rigs	4.2	3.2	3.3	4.1	4.7
Drilling of Oil and Gas	4.2	3.0	2.6	5.0	4.1
Downhole and Other Oilfield Services	2.5	2.2	2.1	2.8	2.3
Tar Sands	0.6	0.4	0.5	0.4	0.5
Oil and Gas Exploration and Development	0.3	0.3	0.3	0.3	0.3
Oilfield Trucking Services	6.7	5.1	5.7	6.8	6.1

3. Lost-Time Claim Rate and Duration Rate

Exploration

Year	# of Accounts	Cost	Person Years	Days Lost	Duration Rate	LTCs	LTC Rate
1997	221	\$640,472	2,880	5,898	205	122	4.2
1998	228	\$532,225	2,711	3,967	146	80	3.0
1999	230	\$256,120	2,224	4,784	215	74	3.3
2000	238	\$1,313,970	2,807	4,817	172	112	4.0
2001	240	\$850,143	2,755	4,135	150	90	3.3

3.1 Lost-Time Claims by Industry Code

09200-Seismic Geophysical and Mineral Exploration

Year	# of Accounts	Cost	Person Years	Days Lost	Duration Rate	LTCs	LTC Rate
1997	64	\$471,345	2,215	4,239	191	90	4.1
1998	69	\$186,034	2,177	2,249	103	49	2.3
1999	67	\$148,437	1,733	3,042	176	40	2.3
2000	71	\$786,425	2,127	3,185	150	80	3.8
2001	68	\$677,056	2,179	2,373	109	64	2.9

09201-Shot Hole Drilling

Year	# of Accounts	Cost	Person Years	Days Lost	Duration Rate	LTCs	LTC Rate
1997	157	\$169,127	665	1,659	249	32	4.8
1998	159	\$346,190	534	1,718	322	31	5.8
1999	163	\$107,682	491	1,742	354	34	6.9
2000	167	\$527,544	679	1,632	240	32	4.7
2001	172	\$173,087	576	1,762	N/A	26	4.5

3.2 Lost-Time Claim Rate by Size of Employer: 2001

Size of Employer	# of Accounts	LTCs	Person - Years	LTC Rate
A: Less than 1 person-years	128	1	54	1.9
B: 1 to 4 person-years	69	9	142	6.3
C: 5 to 9 person-years	13	8	87	9.2
D: 10 to 19 person-years	9	11	132	8.3
E: 20 to 39 person-years	7	12	194	6.2
F: 40 to 99 person-years	8	23	595	3.9
G: 100 or more person-years	6	26	1,551	1.7
Total	240	90	2,755	3.3

4. Analysis of the Lost-Time Claims

4.1 Nature of Injury

LOST-TIME CLAIMS ALBERTA: 1997 TO 2001	OCCURRENCE YEAR					Total	
	1997	1998	1999	2000	2001	Number	Percent
SPRAIN, STRAIN, TEARS	51	40	34	56	35	216	45.2
OTHER TRAUMATIC INJURY/DISEASE	16	9	11	26	12	74	15.5
FRACTURE/DISLOCATION	19	12	12	11	19	73	15.3
SURFACE WOUNDS, BRUISES	11	6	10	8	13	48	10.0
OPEN WOUNDS	8	3	3	5	4	23	4.8
NATURE - UNS	8	3	3	3	3	20	4.2
SYSTEMATIC DISEASES, DISORDERS	7	6	1	1	1	16	3.3
MULTIPLE DISEASE/DISORDERS	2	.	.	.	.	2	0.4
SYMPTOMS, SIGN/ILLNESS	.	1	.	.	1	2	0.4
OTHER DISEASE/DISORDERS	.	.	.	1	1	2	0.4
INFECTIOUS/PARASITIC DISEASE	.	.	.	1	.	1	0.2
BURNS	.	.	.	.	1	1	0.2
Total	122	80	74	112	90	478	100.0

4.2 Type of Event or Exposure

LOST-TIME CLAIMS ALBERTA: 1997 TO 2001	OCCURRENCE YEAR					Total	
	1997	1998	1999	2000	2001	Number	Percent
TRANSPORTATION ACCIDENTS	23	11	6	25	22	87	18.2
OVEREXERTION	23	18	13	15	10	79	16.5
FALL ON SAME LEVEL	11	7	15	13	15	61	12.8
BODILY REACTION	10	6	11	12	11	50	10.5
STRUCK BY OBJECTS	7	9	9	7	9	41	8.6
STRUCK AGAINST OBJECTS	4	2	2	10	6	24	5.0
FALL TO LOWER LEVEL	10	3	3	1	6	23	4.8
CAUGHT IN OBJECTS	5	7	3	5	2	22	4.6
OTHER FALLS	1	2	1	5	2	11	2.3
EXPOSURE TO HARMFUL SUBSTANCES	6	1	.	2	1	10	2.1
REPETITIVE MOTIONS	1	3	1	.	.	5	1.0
OTHER BODILY REACTION/EXERTION	1	.	1	2	.	4	0.8
ASSAULT/VIOLENT ACT BY PERSON	1	1	.	1	.	3	0.6
RUBBED OR ABRADED	.	1	2	.	.	3	0.6
FIRES AND EXPLOSIONS	.	.	.	2	1	3	0.6
UNKNOWN	19	9	7	12	5	52	10.9
Total	122	80	74	112	90	478	100.0

4.3 Part of Body Injured

LOST-TIME CLAIMS ALBERTA: 1997 TO 2001	OCCURRENCE YEAR					Total	
	1997	1998	1999	2000	2001	Number	Percent
BACK	26	19	15	26	20	106	22.2
LEG(S)	16	13	21	24	15	89	18.6
OTHER TRUNK	23	11	13	15	14	76	15.9
ANKLE(S) & FOOT(FEET)-NOT TOES	14	7	6	9	10	46	9.6
HAND(S)	6	6	6	4	10	32	6.7
OTHER HEAD	6	4	4	5	3	22	4.6
MULTIPLE BODY PARTS	6	3	.	9	4	22	4.6
FINGER(S)	9	5	1	1	4	20	4.2
OTHER UPPER EXTREMITIES	5	4	3	6	2	20	4.2
EYE(S)-OPTIC NERVE, VISION	4	3	2	2	3	14	2.9
NECK	3	3	1	5	2	14	2.9
OTHER LOWER EXTREMITIES	1	1	2	4	2	10	2.1
BODY SYSTEMS	2	.	.	1	1	4	0.8
UNKNOWN	1	1	.	1	.	3	0.6
Total	122	80	74	112	90	478	100.0

4.4 Source of Injury

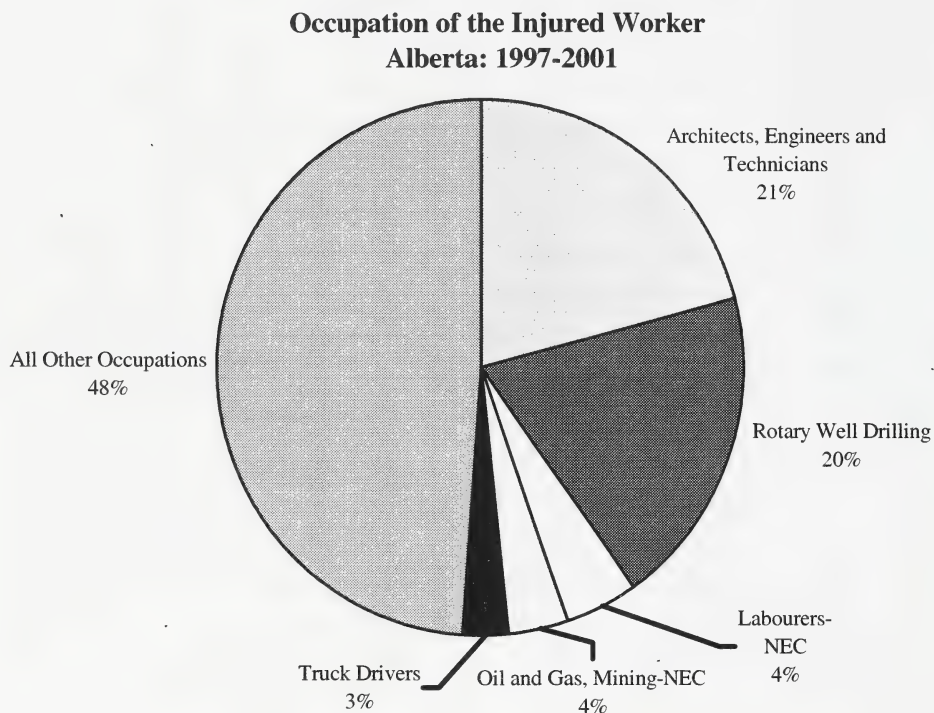
LOST-TIME CLAIMS ALBERTA: 1997 TO 2001	OCCURRENCE YEAR					Total	
	1997	1998	1999	2000	2001	Number	Percent
VEHICLES	26	16	7	27	23	99	20.7
STRUCTURES/SURFACES	17	8	12	14	17	68	14.2
PERSONS-INJURED WORKER	11	7	13	13	11	55	11.5
PARTS & MATERIALS	12	7	9	8	14	50	10.5
OTHER PLANTS/ANIMALS/MINERALS	7	5	7	9	5	33	6.9
CONTAINERS	5	6	2	4	2	19	4.0
MACHINERY	4	5	3	3	3	18	3.8
OTHER SOURCES	3	2	1	5	1	12	2.5
OTHER TOOLS/EQUIPMENT	1	2	1	2	2	8	1.7
MINERAL-METALS/NONMETALS	1	.	1	4	.	6	1.3
CHEMICAL/CHEMICAL PRODUCTS	4	.	.	1	.	5	1.0
HANDTOOLS-UNPOWERED	1	3	1	.	.	5	1.0
PERSONS-NOT THE INJURED WORKER	.	1	.	1	.	2	0.4
HANDTOOLS-POWERED	.	1	.	1	.	2	0.4
FURNITURE & FIXTURES	.	.	.	.	1	1	0.2
UNKNOWN	30	17	17	20	11	95	19.9
Total	122	80	74	112	90	478	100.0

4.5 Duration of Disability

LOST-TIME CLAIMS ALBERTA: 1997 TO 2001	OCCURRENCE YEAR					Total	
	1997	1998	1999	2000	2001	Number	Percent
01 - 05 DAYS LOST	34	9	9	25	15	92	19.2
06 - 10 DAYS LOST	17	13	9	7	13	59	12.3
11 - 15 DAYS LOST	10	3	4	5	8	30	6.3
16 - 20 DAYS LOST	6	6	.	4	6	22	4.6
21 - 30 DAYS LOST	13	11	7	15	9	55	11.5
31 - 40 DAYS LOST	9	6	6	5	5	31	6.5
41 - 50 DAYS LOST	4	8	3	11	2	28	5.9
51 OR MORE DAYS LOST	26	20	29	32	23	130	27.2
DAYS LOST-UNSPECIFIED	3	4	7	8	9	31	6.5
Total	122	80	74	112	90	478	100.0

5. Characteristics of the Injured Worker

5.1 Occupation of the Injured Worker



5.2 Age of Injured Worker

LOST-TIME CLAIMS ALBERTA: 1997 TO 2001	OCCURRENCE YEAR					Total	
	1997	1998	1999	2000	2001	Number	Percent
15-19 YEARS	17	6	2	11	10	46	9.6
20-24 YEARS	35	29	30	37	24	155	32.4
25-34 YEARS	48	26	31	39	34	178	37.2
35-44 YEARS	19	12	10	22	17	80	16.7
45-54 YEARS	2	4	.	2	3	11	2.3
55-64 YEARS	1	3	.	.	.	4	0.8
65 YEARS AND OVER	.	.	1	.	.	1	0.2
AGE-UNSPECIFIED	.	.	.	1	2	3	0.6
Total	122	80	74	112	90	478	100.0

5.3 Length of Time Employed

LOST-TIME CLAIMS ALBERTA: 1997 TO 2001	OCCURRENCE YEAR					Total	
	1997	1998	1999	2000	2001	Number	Percent
A. LESS THAN 1 MONTH	39	27	25	37	24	152	31.8
B. 1 MONTH TO LESS THAN 6 MONTHS	31	25	10	22	15	103	21.5
C. 6 MONTHS TO LESS THAN 1 YEAR	5	6	4	9	1	25	5.2
D. 1 YEAR OR MORE	16	7	10	11	8	52	10.9
E. TIME-UNSPECIFIED	31	15	25	33	42	146	30.5
Total	122	80	74	112	90	478	100.0

5.4 Gender of Injured Worker

LOST-TIME CLAIMS ALBERTA: 1997 TO 2001	OCCURRENCE YEAR					Total	
	1997	1998	1999	2000	2001	Number	Percent
MALE	119	78	73	108	86	464	97.1
FEMALE	2	2	.	3	3	10	2.1
GENDER-UNSPECIFIED	1	.	1	1	1	4	0.8
Total	122	80	74	112	90	478	100.0

6. Cost of Claims and Employer Premiums

Upstream Oil and Gas Sub-Sector #1: Exploration

Transaction Year	Occurrence Year				
	1997	1998	1999	2000	2001
1997	\$615,065				
1998	\$181,101	\$490,316			
1999	\$117,885	\$198,374	\$315,243		
2000	\$65,862	\$71,306	\$266,245	\$1,185,815	
2001	\$35,428	\$213,145	\$118,987	\$454,874	\$763,091
Total cost	\$1,015,340	\$973,142	\$700,475	\$1,640,689	\$763,091
Total Premiums	\$3,728,847	\$2,276,826	\$1,468,896	\$2,148,253	\$2,236,423

The above claim cost and employer premiums are for the five-year period 1997 through 2001. The data are as of May 4, 2002.

The cost of claim amount reflects only paid cost on claims that have occurred in the five-year period. The claim costs are tracked by occurrence year and the year that the costs were transacted.

The premiums are the total of all employers' premiums paid in each year and are calculated by the rate year.

7. Occupational Fatalities

An occupational fatality is the death of a worker that results from a work-related event or exposure. AHRE classifies occupational fatalities into three general types: motor vehicle incident, workplace incident and occupational diseases. Each is described in detail below.

Motor Vehicle Incident

Motor vehicle incidents typically involve highway vehicles operating on public roads in which the fatally injured worker was either the driver or a passenger. This category also includes fatalities involving aircraft crashes, train crashes, helicopter crashes, and water vehicle crashes.

Workplace Incident

Fatal workplace incidents consist of cases in which the worker dies at a work site, or as a result of injuries sustained at a work site. It is this type of fatality that AHRE may be responsible for investigating.

Occupational Diseases

Occupational disease fatalities consist mostly of recognized occupational disease, that is, disease known to be primarily or exclusively work-related (e.g., asbestosis, black lung disease). Occupational diseases are frequently diagnosed many years after the initial or crucial exposure to the toxic substance, and in such cases it is very difficult to determine when the fatal exposure occurred. Thus, the occupational disease category should not be interpreted to reflect present work site hazardous conditions or exposures.

Each year the WCB accepts some occupational fatality claims for compensation. Occupational fatality claims that were accepted in a particular year may include fatalities from prior years.

Description of Exploration Workplace Fatalities Accepted by the Workers' Compensation Board Alberta: 1997-2001

YEAR	Motor Vehicle Incidents		Workplace Incidents		Total	
	N	%	N	%	N	%
1997	1	100.0	0	0	1	100
1998	1	100.0	0	0	1	100
2000	1	25.0	3	75.0	4	100
2001	2	66.7	1	33.3	3	100
Total	5	55.6	4	44.4	9	100

8. Description of Workplace Fatalities Investigated by Occupational Health and Safety: 1997-2001

YEAR:	2000	FILE: 948
OCCUPATION:	Driller	AGE: 28
INDUSTRY:	Shot Hole Drilling	
EXPERIENCE:	Unknown	

DESCRIPTION: The driller and his helper drove a Nodwell 110 tracked vehicle to the staging area to refill the water tank. After refilling the tank, the driller started to drive the Nodwell 110 up the seismic cut line. The helper was seated in the rear of the vehicle cab; neither man was wearing seat belts. The vehicle was three quarters of the way up the steep incline when it started to slip backwards. The Nodwell 110 continued to slide backwards until it rolled on the driver's side. The helper remained inside the cab. The driller, however, was thrown from the cab and was pinned under the vehicle.

YEAR:	2000	FILE: 952
OCCUPATION:	Labourer	AGE: 44
INDUSTRY:	Seismic Geophysical and Mineral Exploration	
EXPERIENCE:	7.5 Years	

DESCRIPTION: Five workers (A, B, C, D and E) were laying out geophone lines for recording source signals. Three ground crew workers (A, B, C) were planting geophone lines on the ground. Worker D was dispensing lines to the workers on the ground from the deck of the line vehicle. Worker E was driving the line vehicle. Another vehicle driven by a troubleshooter going in the opposite direction, passed the line vehicle and workers, and got stuck in a snow bank. Once the troubleshooter freed the vehicle, he proceeded backwards down the line. While backing up he suddenly heard someone yell at him to stop. At the same time the troubleshooter felt the rear end passenger side the vehicle go up on something. Ground Crew Worker B had been run over by the vehicle.

YEAR:	2000	FILE: 956
OCCUPATION:	Seismic Assistant and Seismic Blaster	AGE: 22
INDUSTRY:	Shot Hole Drilling	
EXPERIENCE:	8 Months	

DESCRIPTION: The seismic drilling crew arrived in the tracked drilling vehicle at their designated start point and proceeded to conduct drilling activities. Prior to leaving the vehicle, the driller updated the explosives recording manifest. He did not see the assistant remove explosives from the vehicle's magazine. The driller exited the cab and commenced drilling activities. Approximately three minutes later, he heard an explosion. The driller ran to the north side of the tracked vehicle and found the fatally injured assistant lying in the snow.

The investigation found that a headlamp battery in close proximity to a pre-primed explosive charge might have triggered the explosion.

Appendix A: Terms, Definitions, and Formulas

Lost-Time Claim A lost-time claim (LTC) is a claim for an occupational injury or disease, which disables the worker beyond the day of injury. Included are claims for which wages compensation are paid, permanent disability claims, fatalities, and cases in which the injured worker is assigned light duties or other modified work.

Person-Years Person-year estimates are calculated from wage and payroll data provided by account holders to the WCB. Resources and Employment uses these data to estimate an average industry wage, and uses the average industry wage and employer payroll data to estimate person-years for each employer and each industry. One person-year is equivalent to one full-time worker working for one year, and can be assumed to equal 2,000 hours worked.

LTC Rate The lost-time claim (LTC) rate is calculated by dividing the number of lost-time claims by the person-year estimate, and multiplying the result by 100. The LTC rate represents the probability or risk of disabling injury or disease to a worker during a period of one-year work. Comparisons of LTC rates between industries, or between years, can be used to indicate increases, decreases, or differences in this risk.

$$\text{LTC Rate} = \frac{\text{Number of LTCs} \times 100}{\text{Estimated Person-years}}$$

Duration (Days Lost) The duration of disability is the number of days following the injury or disease for which the worker was disabled, and unable to perform normal work duties. This information is obtained for this report from data on compensation days paid on each claim from WCB. Resources and Employment obtains these data on March 31 of the year following the claim year, and does not update the information, even though many injured workers continue to be disabled beyond this date. As a result, the duration information reported here underestimates the true impact of lost-time injury and disease.

Duration Rate The duration rate is calculated by dividing the number of workdays lost (disability days) by the person-year estimate, and multiplying by 100. The result is expressed as days lost per 100 person-years worked, and indicates, in part, the economic impact of occupational injury and disease. Duration rates are not recommended as reliable indicators of full economic cost. In addition, readers are warned that duration rates are highly unstable when based on only a few lost-time claims; it is recommended that the duration rate not be calculated based upon fewer than 30 lost-time claims.

$$\text{Duration Rate} = \frac{\text{Disability Days} \times 100}{\text{Estimated Person-Years}}$$

WCB Accepted Fatality An occupational fatality is the death of a worker which resulted from a work-related incident or exposure and which has been accepted by the WCB for compensation. A fatality is counted in the year it is accepted.

NEC Means 'Not Elsewhere Classified'.

UNS Means 'Unspecified'.

Appendix B: Upstream Oil and Gas 2001 Industry Codes

Sub-Sector #1: Exploration

Industries: 09200-Seismic Geophysical and Mineral Exploration
09201-Shot Hole Drilling

Sub-Sector #2: Oilfield Maintenance and Construction

Industries: 06304-Oilfield Construction and Maintenance (Upstream of Processing Plants)

Sub-Sector #3: Well Servicing with Service Rigs

Industries: 09903-Well Servicing with Service Rigs including Power Swivels

Sub-Sector #4: Drilling of Oil and Gas Wells

Industries: 09600-Drilling of Oil and Gas Wells

Sub-Sector #5: Downhole and Other Oilfield Services

Industries: 06305-Field Production Operators
06306-Vacuum Removal of Waste-Industrial, Commercial and Oilfield
09900-Mud Logging
09902-Pressure Cleaning Services
09904-Rathole Drilling and Service Rig Anchoring
09911-Oilfield Downhole Services
09915-Well Casing Services
09921-Servicing Christmas Trees on Oil Wells by Means of a Tree Saver
09927-Liquid Waste Treatment and Disposal

Sub-Sector #6: Tar Sands

Industries: 06600-Mining and Processing of Bituminous Sand for Oil Extraction
06601-Research and Development, Oil Sands and Heavy Oil Recovery

Sub-Sector #7: Oil and Gas Exploration and Development

Industries: 06300-Oil and Gas Exploration and Development-Upstream Operations

Sub-Sector #8: Oilfield Trucking Services

Industries: 50720-Oilfield Trucking Services

For Further Information Contact:

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Fax: 780-422-5070

Resources and Employment website:
<http://www.gov.ab.ca/hre>

Alberta Workplace Health and Safety website:
<http://www.gov.ab.ca/hre/whs>

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